The Association of Minority Racial Group Status and Childhood Adversity on Diurnal HPA Axis Activity

Senior Thesis

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by
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Abstract

This study examined daily cortisol levels in adults with low-to-moderate childhood adversity and with minority racial group statuses. Previous studies have found that severe childhood adversity is associated with a flattening of the expected diurnal cortisol curve, there has been limited and contradictory research among those with low-to-moderate levels of childhood adversity. Furthermore, there is a need for research into the different effects of early life adversity in the health of minority adults, as minority children are exposed to higher rates of childhood adversity than White children. Sixty-one adult participants completed the Childhood Trauma Questionnaire (CTQ), along with racial demographic questionnaires. CTQ scores were low-to-moderate, ranging from 37-73 (mean=45.4 ± 8.7 SD). CTQ score was significantly correlated with lower cortisol at wake-up ($r=-.35, p=.006$). Cortisol was significantly decreased at wake-up in those with low-to-moderate adversity (n=29) ($r=-.35, p=.006$) compared to those without (n=32). Additionally, cortisol was significantly increased in the afternoon (at wake-up + 9 hours) in those with increased childhood adversity ($t=2.79, p=.007$). A repeated measures analysis of covariance found that those with increased childhood adversity had a blunted daily curve (time effect: $F(2.7, 166.8) = 2.92; p < .043$). There was no significant relationship between minority racial group status and childhood adversity ($p=.263$), or the diurnal cortisol slope ($p=.624$). These findings signify low-to-moderate levels of childhood adversity as a potential precursor of many physical health disorders associated with a dysregulated hypothalamic-pituitary-adrenal (HPA) axis.
The Association of Minority Racial Group Status and Childhood Adversity on Diurnal HPA Axis Activity

Introduction

Adverse childhood experiences (ACE’s) have been associated with negative psychological and physiological health outcomes in adults, particularly in the inflammatory immune response and in the reactivity of the hypothalamic-pituitary-adrenal (HPA) axis (Carpenter, Gawuga, Tyrka, Lee, Anderson, & Price, 2010; Champagne & Meaney, 2001). There are five widely accepted subtypes of ACE’s that may be experienced in early life: physical, emotional, or sexual abuse, and physical or emotional neglect (Leeb, Paulozzi, Melanson, Simon, & Arias, 2008). Minority children are exposed to higher rates of early life adversity than White children, particularly African Americans, with 6.5 more victimized children per 1000 (U.S. Department of Health and Human Services, 2015). The disparity in the rates of childhood adversity among the races suggests that there is a need for research into the lasting health consequences of adversity between minority and non-minority groups.

Childhood Adversity and Adult Health Consequences

Many links have been found connecting childhood adversity to the incidence of later life disease in adults. Childhood adversity, as a risk factor for adult asthma, has been repeatedly substantiated within the literature (Bhan, Glymour, Kawachi, & Subramanian, 2014; Korkeila et al., 2012; Scott et al., 2008). Adversity has been linked to many chronic disorders including chronic pain, headaches, and arthritis (Sweeney, Air, Zannettino, & Galletly, 2015), and has even been implicated in life threatening disorders such as chronic obstructive pulmonary disease (Anda et al., 2008), ischemic heart disease, cancer, skeletal fractures, liver disorders (Felitti et al., 1998), strokes, and diabetes (Gilbert et al., 2015).
In addition to the physical health ramifications of ACE’s in adults, studies have shown higher rates of psychological disorders, such as lifetime depressive symptoms and suicide attempts (Sweeney, Air, Zannettino, & Galletly, 2015; Kim et al., 2013). In those with depression, childhood adversity is further associated with poor clinical treatment course, earlier age of depression onset, and depressive episode persistence and recurrence (Tunnard et al., 2014). Severe adversity is frequently associated with the onsets of anxiety disorders (MacMillan et al., 2001; Mancini, Van Ameringen, & MacMillan, 1995; Spataro, Mullen, Burgess, Wells, & Moss, 2004; Young, Abelson, Curtis, & Nesse, 1997). These anxiety disorders also include obsessive compulsive disorder (OCD; (Lochner et al., 2002)), social phobia, and post-traumatic stress disorder (PTSD; (Cougle, Timpano, Sachs-Ericsson, Keough, & Riccardi, 2010; Gibb, Chelminski, & Zimmerman, 2007; Kilpatrick et al., 2003)).

**Childhood Adversity and Racial Health Disparities**

In the context of adult psychological health and ACE’s, research has shown significant differences between racial groups. Black and Hispanic children are exposed to more early life adversities compared with White children, and this disparity in exposure to adversities persists after adjustment for income (Slopen et al., 2016). African Americans are more vulnerable to the adverse emotional and physical effects of family stressors (Cichy, Stawski, & Almeida, 2012). Incarcerated African American men who report experiences of childhood sexual victimization and inmate Hispanic women who report adverse foster care experiences are significantly more depressed than other prisoners (Roxburgh & MacArthur, 2014).

As ACE’s are implicated in racial differences of psychological disorders, it is possible that ACE’s are a risk factor for much of the physical health disparities between races. In general populations, research has found extensive differences in the prevalence of disease in White and
non-White racial groups. Minorities have the highest rates of hypertension, cardiovascular disease, diabetes mellitus, and strokes (Mozaffarian et al., 2015). The cause of these health differences may be related to the increased exposure to stress during the childhoods of minority groups (Umberson, Williams, Thomas, Liu, & Thomeer, 2014). While these disparities in disease prevalence rates among minorities and non-minorities are jarring, less information is available regarding the potential biological precursors to such diseases.

**Childhood Adversity and Health Pathways**

Previous research on childhood adversity has shed light on the potential connections between ACE’s and health in adults through altered HPA axis functioning. Childhood is an important time for the development of many brain regions. In particular, early childhood is a critical time period for hippocampal development (Lupien et al., 2009). This creates a window of vulnerability where high amounts of stress have the potential to alter the trajectory of development of the hippocampus through changing levels of glucocorticoid release. Early life stress stimulates the HPA axis to produce excess glucocorticoids, which regulate gene expression in the hippocampus. This can alter the functioning and size of the hippocampus, which is responsible for regulating the HPA axis in later life (Lupien et al., 2009). Studies have directly linked reduced hippocampal volume to early childhood adversity in participants with physical and sexual abuse (Andersen & Teicher, 2008). Similar to the psychological effects of childhood adversity in adults, reductions in hippocampal volume have been implicated in depression (Videbech & Ravnkilde, 2004) and PTSD (Smith, 2005).

Altered hippocampal volume may explain the link between childhood adversity and adult health as it has been highly associated with glucocorticoid hyposcretion in later life (Gunnar & Donzella, 2002). The HPA axis coordinates the daily circadian rhythm of cortisol secretion,
which is at its highest half an hour after waking up in the morning and slowly decreases throughout the day (Gonzalez, Jenkins, Steiner, & Fleming, 2009). Because the HPA axis is thought to down-regulate inflammation (Powell, Tarr, & Sheridan, 2013), daily glucocorticoid hyposcretion has been found to be related to many negative effects on health in adults.

**HPA Axis Dysfunction and Health**

A blunted daily cortisol curve is considered unhealthy and is a precursor of many physical health disorders, which may result from the increased inflammation associated with an irregular HPA axis, such as chronic fatigue syndrome, fibromyalgia, chronic headaches, and rheumatoid arthritis (Heim, Ehlert, & Hellhammer, 2000). It has also been implicated in early lung and breast cancer death (Sephton, Lush, Dedert, Floyd, Rebholz, Dhabhar, Spiegel, & Salmon, 2013; Sephton, Sapolsky, Kraemer, & Spiegel, 2000). Furthermore, the psychological disorders of depression (Stetler & Miller, 2005) and PTSD (Roy, 2002; Yehuda, Halligan, & Grossman, 2001; Yehuda, Golier, & Kaufman, 2005) have been associated with the blunted daily curve. These negative health consequences closely resemble the diseases associated with childhood adversity in adult health, signifying a blunted daily cortisol curve as a potential mechanism for this pathway.

**Childhood Adversity and the HPA axis**

HPA axis studies have found a flattening of the expected diurnal cortisol curve in the context of severe childhood adversity. A longitudinal study of sexually abused girls found that childhood adversity resulted in hypercortisolism during early life but that this later developed into hypocortisolism, around age 18 (Tarullo & Gunnar, 2006). In particular, morning cortisol levels have been shown to be lower in adults with severe childhood maltreatment (Van der Vegt, Van der Ende, Kirschbaum, Verhulst, & Tiemeier, 2009; Tarullo & Gunnar, 2006). Many studies
also contradictorily report elevated diurnal cortisol curves in adults with childhood trauma. Daily cortisol levels are higher in women with chronic pain and severe childhood trauma (Nicolson et al., 2010). Similarly, higher levels of awakening cortisol have been seen in postpartum women with severe ACE’s (Gonzalez, Jenkins, Steiner, & Fleming, 2009). In addition to controlling daily cortisol rhythm, the HPA axis is also responsible for the adaptive biochemical stress response to external stimuli. Both hypo- and hyper-reactivity in cortisol responses to stress have been found in adults with ACE’s (Champagne & Meaney, 2001; Engert et al., 2010; Heim, Ehlert, & Hellhammer, 2000).

Additional variables such as the severity of the maltreatment, presence of physical and psychological disorders, and the sex or race of the participant might alter the extent that childhood adversity is able to impact the HPA axis. With these factors widely varying across the majority of the existing research, it is difficult to compare study results. Further research into the specific association of each of these potentially confounding factors is necessary for an integrated understanding of the relationship between childhood adversity and the HPA axis. The current literature has focused on severe levels of childhood adversity in order to demonstrate a convincing relationship with its many negative health consequences in adults. As such, there is a lack of existing literature on the potential effects of low-to-moderate adversity in healthy adults. Similarly, there is a lack of information on the differences in HPA axis functioning between minorities and non-minorities with childhood adversity. Life events and chronic stress have been implicated in the phenomenon of racial differences in daily cortisol slopes, as African Americans and Hispanics/Latinos have shown flatter diurnal slopes (DeSantis, Adam, Hawkley, Kudielka, Cacioppo, 2015). It is possible that similar differences would be seen in association with early
life adversity. The individual differences between participants may contribute to the contradictory reports of blunted and elevated cortisol levels within the literature.

Based on these previous findings, we hypothesize that healthy individuals with a history of low-to-moderate childhood adversity will have altered HPA axis functioning, as evidenced by an atypical daily cortisol curve. Furthermore, we hypothesize that minority individuals will have greater variations from the expected daily cortisol pattern than non-minorities, as altered HPA axis functioning may be a risk factor possibly explaining the racial gap in disease rates.

Method

Participants

This study selected sixty-one healthy adults from Brandeis University and the greater Boston area, MA, based on specific criteria including: (a) body mass index (BMI) between 18 and 35 kg/m²; (b) luteal phase of menstrual cycle at time of participation, for females; (c) absence of psychiatric, endocrine, cardiovascular diseases, or other chronic diseases; (d) no intake of psychoactive drugs, beta-blockers, gonadal steroids (hormonal contraceptives), GCs; and (e) non-smokers. Of the participants, 30 were males and 31 were females. Ages ranged from 18-65 years old (Mean= 37.8 ± 18.4 SD). Participant BMI ranged from 17.9 - 35.0 kg/m² (Mean= 25.3 ± 3.6 SD). Participant body fat was between 9.5 - 45 % (Mean= 25.3 ± 7.1 SD).

HPA Axis Assessment

Participants were instructed in the laboratory and later provided 12 saliva samples while conducting their average daily routine over the course of two days. Samples were taken at wake-up time, wake-up + 30 minutes, wake-up + 1 hour, wake-up + 4 hours, wake-up + 9 hours, and finally wake up + 13 hours, on two consecutive days. Cortisol at each time point was averaged across the two days in order to increase the reliability of the measurements. Salivary free cortisol
levels were collected using salivettes and measured using a competitive chemiluminescence immunoassay. Different indicators of basal HPA axis activity were computed including the area under the curve at the cortisol awakening response, or a half hour after wake up, and the slope of the decline in cortisol levels throughout the day without the awakening responses.

**Self-Reports of Childhood Adversity**

Participants were asked to provide their demographic information and to complete the Childhood Trauma Questionnaire (CTQ; (Bernstein et al., 1994)), a 28-item, measure of childhood adversity. Participants report on their childhood experiences with the five types of maltreatment; physical abuse, sexual abuse, emotional abuse, physical neglect, and emotional neglect. Sample items from the questionnaire include “People in my family hit me so hard that it left bruises or marks”, “I had to wear dirty clothes”, “People in my family called me things like ‘stupid,’ ‘lazy,’ or ‘ugly.’” The CTQ yields a score of overall adversity, out of a possible range of 25 to 125, and a score in each of the subscales, ranging from 5 to 25. Scores were used to split the sample into two groups, those with low-to-moderate childhood adversity and those with below threshold reported history of adversity, labeled as the no adversity group. The division was based on previously established cutoff scores for CTQ and each subscale. The cut off scores for physical abuse, physical neglect, and sexual abuse were 8. The cut off score for emotional neglect was 15, and emotional abuse was 10. The total CTQ cut off score was 49 (Walker et al. 1999). The sample was also subdivided among minorities and non-minorities based on reported ethnic identities. Diurnal cortisol levels were compared between the groups to determine the differences between individuals with and without low-to-moderate childhood adversity, and between minorities and non-minorities.
Demographic Self-Report Data

Participants reported racial identities in five categories, Asian (n=13), Black or African American (n=3), other (n=3), more than one race (n=3), and White (n=36). Due to a lack of diversity in the sample, all participants within the four non-White racial categories were combined and labeled the minority group (n=24), while the White participants were labeled the non-minority group (n=36). There were 3 participants who chose not to report their ethnicity, they were not included in the analysis, see Table 1 for breakdown.

Statistical Analysis

To address the first hypothesis that individuals with childhood adversity have an altered diurnal cortisol curve, Pearson correlational analyses were used to examine the continuous relationship between overall CTQ score and the subscale scores with cortisol at each time point. Hierarchical linear regressions were used to control for age, sex, and body fat. Additionally, in order to examine group differences between those with and without childhood adversity a repeated measures analysis of covariance including all of the cortisol time-points was utilized. Finally, to examine the second hypothesis that minority groups have a greater change in the diurnal cortisol curve than non-minority groups, independent samples t-tests were used to test the differences between those who self-identify as a minority and those who do not.

Results

Childhood Adversity Self-report Data

Participants had overall CTQ scores ranging from 37-73 (mean=45.4 ± 8.7 SD). The participants scored either in the low-to-moderate range (n=29), or below threshold, considered no adversity (n=32.) Participant scores differed in range between the subscales: physical abuse 5-20 (mean=6.6 ± 3.1 SD), emotional abuse 5-19 (mean=6.6 ± 3.1 SD), physical neglect 5-15
RACIAL STATUS, CHILDHOOD ADVERSITY, AND THE HPA AXIS

(mean=6.3 ± 2.2 SD), and emotional neglect 5-19 (mean=9.8 ± 4.0 SD). Scores for childhood experiences of sexual abuse were particularly low ranging from 5-6 (mean=5.1 ± 2.6 SD). See Table 2.

Diurnal Cortisol

Cortisol at each time point was measured for all participants. Averaged across the two days, results displayed a similar diurnal cortisol curve as established reports with a significant time effect (F (2.7, 166.8) = 72.9; p < 0.001), see Figure 1. Morning cortisol levels peaked at the cortisol awakening response time point, wake-up + 30 minutes, and gradually declined until the last time point, wake-up + 13 hours.

Childhood Adversity and Diurnal Cortisol Time Points

The association of low-to-moderate childhood adversity with an altered daily cortisol at each time point was tested using Pearson correlational analyses. Low-to-moderate childhood adversity was significantly correlated with lower cortisol at the wake-up time point (r=-.35, p=.006) (Figure 2), as were the subscales physical neglect (r=-.27, p=.03) (Figure 3) and physical abuse (r=-.32, p=.01) (Figure 4). These results show an inverse relationship, where high levels of childhood adversity are associated with lower cortisol at wake up. There was no significant relationship of low-to-moderate adversity (r=.03, p=.85) or any of the subscales (all r<.12 all p>.37) with the cortisol awakening response. Independent samples t-tests showed low-to-moderate adversity was significantly correlated with higher cortisol in the afternoon at the wake-up + 9 hours time point (t=2.79, p=.007) (Figure 5).

Childhood Adversity and Diurnal Cortisol Curve

Focusing on the decrease in cortisol levels from the wake up time point, without the peak values of the cortisol awakening response, there was a marked difference between the slopes of
the childhood adversity and non-adversity groups. A repeated measures analysis of covariance found that there was a difference in the pattern of daily cortisol between those with and without increased CTQ (group by time interaction: $F(2.7, 166.8) = 2.92; p < 0.043$), in which those with low-to-moderate childhood adversity had a blunted daily curve (Figure 6). The diurnal slope of the participants with childhood adversity was significantly less negative than the slope of participants without (Figure 7). Increasing levels of childhood adversity were associated with increasingly less negative slope and flatter diurnal cortisol curves (Figure 8).

**Minority Racial Group Status, Diurnal Cortisol, and Childhood Adversity**

The racial groups were analyzed, and, contrary to our hypothesis, there was no significant relationship between minority racial group status and overall childhood adversity or any of the subscales (all p's > .097), see Table 3. Furthermore, there was no significant relationship between the minority group and the biological markers of diurnal cortisol activity at any specific time points, nor with the daily slope calculations (all p's > .204) (Table 4).

**Discussion**

**Summary**

Low-to-moderate childhood adversity in healthy adults had no relationship with the peak cortisol values of the cortisol awakening response; however, there was significantly lower cortisol at wake-up in those with a history of overall childhood adversity, as well as with two of the CTQ subscales: physical abuse and physical neglect. There was a significantly higher level of cortisol at the 9 hours after wake-up time point in those with overall childhood adversity. These deviations from the normal pattern of daily cortisol resulted in a significantly flatter diurnal cortisol slope for participants with low-to moderate childhood adversity. No relationships
between childhood adversity, or any of the biological markers of cortisol levels, were found with our groups of minority- and non-minority adults.

**Relationship to Literature**

Although these participants had low-to-moderate ACE’s, the results of this study support the conclusions of previous literature showing an effect of severe childhood maltreatment on morning cortisol levels (Van der Vegt, Van der Ende, Kirschbaum, Verhulst, & Tiemeier, 2009; Tarullo & Gunnar, 2006). Furthermore, as this study showed decreased daily cortisol it contradicts the results of research showing higher cortisol levels in those with severe childhood trauma (Nicolson et al., 2010). Prior research had shown an effect on the cortisol awakening response in the context of severe ACE’s, however, this study showed no significant relationship (Gonzalez, Jenkins, Steiner, & Fleming, 2009). It is possible that the CAR is affected only in those with severe childhood adversity.

Statistically, Black and Hispanic children are exposed to more ACE’s than White children, however this study showed no association between race and childhood adversity (Slopen et al., 2016). Moreover, the cortisol levels of the minority group were not found to be more affected by childhood adversity than the White participants, despite previous research showing that African Americans have increased vulnerability to the physical effects of stressors (Cichy, Stawski, & Almeida, 2012).

**Implications**

The association of flatter slopes with increasing levels of childhood adversity supports previous studies showing that adverse childhood psychosocial conditions are related with altered cortisol curves in adults, and that blunted cortisol curves are found in those with severe abuse and/or comorbid conditions. This study extends upon the literature, and finds that even low-to-
moderate abuse is related to flatter diurnal slopes in otherwise healthy adults. These results may potentially point to low-to-moderate childhood adversity as a risk factor for diseases associated with blunted cortisol curves.

These results also contradict previous research which displayed steeper daily cortisol curves for low-to-moderate childhood adversity (Van der Vegt, Van der Ende, Kirschbaum, Verhulst, & Tiemeier, 2009). Van der vegt et al. (2009) included Dutch participants, and the authors report that because of language variations, their questionnaire was less able to pick up on effects of emotional abuse. Furthermore, Van der vegt et al. (2009) recorded levels of childhood adversity from official documents provided by adoption organizations and adoptive parents’ observations of childhood adversity. With this type of questioning, physical subscales may be more likely to be reported than emotional abuse, due to more obvious physical signs. In comparison, this study utilizing self-report data was able to better assess emotional maltreatment and included participants with similar rates of the emotional and physical subscales. Differences in participant demographics, methods, and survey design may account for the discrepancy between our results. The additional sensitivity of our study to emotional childhood adversity may explain the ability of this study to show blunting in daily cortisol for individuals with low-to-moderate adversity rather than steeper cortisol curves.

**Limitations**

Our study did have the limitations commonly associated with use of unsupervised saliva collections, such as non-compliance with salivette instructions. In addition, there was the potential for recall bias due to the use of self-report questionnaires. It is possible that the Childhood Trauma Questionnaire may not be the best measure for low-to-moderate scores of childhood adversity, future studies should look into using measures better aimed at
understanding and differentiating severity of early life adversity using both quantitative and qualitative questionnaires.

Within the low-to-moderate adversity group, very few participants reported instances of sexual abuse, this would account for the lack of significant association between sexual abuse and changes in cortisol level at any time point. However, it makes generalization of the results of this study to childhood sexual abuse victims difficult.

There was no association of minority racial group status and variation in diurnal cortisol in our sample. Increased deviation from normal cortisol levels was predicted due to increased rates of childhood adversity in minority groups. The participants in this study showed no differences in amounts of childhood adversity based on race, which can explain why no difference in diurnal cortisol was observed. This study was limited in number of participants with non-White racial identities, so all minority racial groups had to be combined for comparison to White participants. Previous research has shown varying rates of childhood adversity amongst minority groups, with African Americans having the highest rates. It is possible this study could have found an association of increased adversity and higher deviations in daily cortisol with a more diverse sample.

**Future Directions**

A larger study with a more diverse participant pool may be better able to show differences in the severity of childhood adversity between races, and through this, differences in diurnal cortisol levels. In such a study, rather than comparing minority with non-minority groups, it would be more useful to compare specific racial groups, for example; Black or African American, Hispanic, and Asian, and White groups.
It is believed that the blunted cortisol curve is a consequence of hippocampal functional changes due to early life adversity. However, adolescent adversity has been shown to affect the frontal cortex which is more associated with changes in the adult glucocorticoid response to stress instead of alterations in daily cortisol levels (Lupien et al., 2009). This signifies age of onset and duration of childhood adversity as an important mediating factor in adult HPA axis functioning. Future studies will determine the influence of age of onset of adversity and diurnal cortisol levels.

**Conclusions**

We found that in a group of healthy adults with low-to-moderate childhood adversity, cortisol at wake up was decreased, and cortisol later in the day was increased, signifying a flattening of the diurnal cortisol curve. The finding that daily cortisol level differences can be seen in those with even low-to-moderate levels of adversity is important because a blunted daily curve is considered a risk factor for many psychological and physical health disorders associated with a dysregulated HPA axis.
References


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http://doi.org/10.1177/0022146514521426


relationship to intergenerational effects of trauma, parental PTSD, and cortisol excretion

Dev. Psychopathol. 13: 733–753

Tables and Figures

Table 1

<table>
<thead>
<tr>
<th>Race</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian</td>
<td>13</td>
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<tr>
<td>Black or African American</td>
<td>3</td>
</tr>
<tr>
<td>White</td>
<td>36</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
</tr>
<tr>
<td>More than one race</td>
<td>3</td>
</tr>
<tr>
<td>Do not wish to answer</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>61</td>
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Participant reports of racial identities.
Table 2

<table>
<thead>
<tr>
<th>CTQ Scale</th>
<th>Mean (SD)</th>
<th>Range</th>
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<tbody>
<tr>
<td>CTQ Total</td>
<td>45.4 (8.7)</td>
<td>37 to 73</td>
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<tr>
<td>Physical Abuse</td>
<td>6.6 (3.1)</td>
<td>5 to 20</td>
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<tr>
<td>Emotional Abuse</td>
<td>8.8 (3.7)</td>
<td>5 to 19</td>
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<tr>
<td>Sexual Abuse</td>
<td>5.1 (2.6)</td>
<td>5 to 6</td>
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<td>Physical Neglect</td>
<td>6.3 (2.2)</td>
<td>5 to 15</td>
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<tr>
<td>Emotional Neglect</td>
<td>9.8 (4.0)</td>
<td>5 to 19</td>
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Childhood Trauma Questionnaire Scores in overall childhood adversity, CTQ total, and each of the 5 subscales, for all participants.
Table 3

<table>
<thead>
<tr>
<th>CTQ Scale</th>
<th>M (SD)</th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTQ Total</td>
<td>48.037 (10.275)</td>
<td>1.131</td>
<td>60</td>
<td>0.263</td>
</tr>
<tr>
<td>Sexual Abuse</td>
<td>5.482 (1.578)</td>
<td>-1.264</td>
<td>60</td>
<td>0.211</td>
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<tr>
<td>Emotional Neglect</td>
<td>10.778 (4.534)</td>
<td>1.631</td>
<td>60</td>
<td>0.108</td>
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<tr>
<td>Physical Neglect</td>
<td>6.482 (2.359)</td>
<td>1.524</td>
<td>60</td>
<td>0.133</td>
</tr>
<tr>
<td>Emotional Abuse</td>
<td>9.333 (4.206)</td>
<td>1.688</td>
<td>60</td>
<td>0.097</td>
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<tr>
<td>Physical Abuse</td>
<td>7.259 (3.623)</td>
<td>1.816</td>
<td>60</td>
<td>0.074</td>
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</table>

No association of minority group racial status with overall childhood adversity or any of the subscales.
Table 4

<table>
<thead>
<tr>
<th></th>
<th>M (SD)</th>
<th>t</th>
<th>df</th>
<th>p</th>
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<tbody>
<tr>
<td>Daily Cortisol Slope</td>
<td>-0.863 (0.691)</td>
<td>0.493</td>
<td>61</td>
<td>0.624</td>
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<tr>
<td>Cortisol Awakening Response</td>
<td>5.141 (9.097)</td>
<td>-0.272</td>
<td>61</td>
<td>0.787</td>
</tr>
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</table>

No association of minority racial group status with differences in the pattern of daily cortisol in participants with childhood adversity.
Figure 1

The salivary cortisol levels at 6 time points averaged over 2 days for all participants displaying the diurnal cortisol curve.
Cortisol at the wake up time point was significantly associated with low-to-moderate childhood adversity.
Cortisol at the wake up time point was significantly associated with the physical neglect subscale.
Cortisol at the wake up time point was significantly associated with the physical abuse subscale.
Childhood adversity was associated with decreased cortisol at the wake up time point and increased cortisol at the wake-up + 9 hours time point.
A difference in the pattern of daily cortisol between those with and without increased CTQ, those with low-to-moderate childhood adversity had a blunted daily curve.
The diurnal slope of the participants with childhood adversity is significantly less negative than the slope of participants without.
Figure 8

Increasing levels of childhood adversity were associated with increasingly less negative slope and flatter diurnal cortisol curves.